# WEST Search History

Hide Items Restore Clear Cancel

DATE: Monday, October 23, 2006

| Hide? | Set Name | Query | Hit Count |
|---|---|---|---|
| | | *DB=USPT; PLUR=YES; OP=OR* | |
| ☐ | L11 | L10 and l9 | 8 |
| ☐ | L10 | 705/45 | 335 |
| ☐ | L9 | L8 and l7 | 69 |
| ☐ | L8 | MICR | 1486 |
| ☐ | L7 | L6 and l5 | 316 |
| ☐ | L6 | @ad<20000428 | 3040920 |
| ☐ | L5 | L4 and l3 | 486 |
| ☐ | L4 | bank or financial near5 (institution or organization or central) | 110256 |
| ☐ | L3 | L2 and l1 | 1493 |
| ☐ | L2 | check near7 (image or picture or photo or photograph) | 8483 |
| ☐ | L1 | (central or center) near7 (site or workstation or terminal or system or computer) | 211368 |

END OF SEARCH HISTORY

? show files

[File 15] **ABI/Inform(R)** 1971-2006/Oct 23


[File 9] **Business & Industry(R)** Jul/1994-2006/Oct 20


[File 610] **Business Wire** 1999-2006/Oct 23

**File 610: File 610 now contains data from 3/99 forward. Archive data (1986-2/99) is available in File 810.*

[File 810] **Business Wire** 1986-1999/Feb 28


[File 613] **PR Newswire** 1999-2006/Oct 23

**File 613: File 613 now contains data from 5/99 forward. Archive data (1987-4/99) is available in File 813.*

[File 813] **PR Newswire** 1987-1999/Apr 30


[File 16] **Gale Group PROMT(R)** 1990-2006/Oct 20


[File 160] **Gale Group PROMT(R)** 1972-1989


[File 148] **Gale Group Trade & Industry DB** 1976-2006/Oct 23


[File 20] **Dialog Global Reporter** 1997-2006/Oct 23


```
; d s
Set      Items    Description
S1       32267    S (CHECK OR CHECKS)(7N)(IMAGE? OR PICTURES OR PHOTO OR PHOTOS OR
PHOTOGRAPH OR PHOTOGRAPHS)
S2     1133054    S (CENTRAL OR CENTER)(7N)(BANK OR TERMINAL OR WORKSTATION OR SITE OR
STATION)
S3        1767    S S1 AND S2
S4    11653463    S BANK? OR FINANCIAL(5N)(INSTITUTION OR ORGANIZATION OR SITE OR REMOTE)
S5        1587    S S3 AND S4
S6     1848421    S MICR?
S7         259    S S5 AND S6
S8       26788    S DEPOSIT?(7N)(CHECK OR CHECKS)
S9         100    S S7 AND S8
S10   13914087    S PD<000428
S11          5    S S9 AND S10
```

t s11/9/all

11/9/1 (Item 1 from file: 15) Links

Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT ProQuest

ABI/Inform(R)



02244376 84987192

**Redesigning check-processing operations using animated computer simulation**

Verma, Rohit; Gibbs, Gerald D; Gilgan, Richard J

Business Process Management Journal v6n1 pp: 54
2000
**ISSN:** 1463-7154 **Journal Code:** BPMT
**Document Type:** Periodical; Feature **Language:** English **Record Type:** Fulltext
**Word Count:** 2956

**Abstract:**

This paper describes steps undertaken by one of the largest commercial **banks** in the US to upgrade and redesign check-processing operations at their central facility in Chicago. It provides an overview of current check-processing operations and describes steps taken to improve the reject repair process. The current reject repair process is very labor-intensive and has been replaced by an automated process based on high-speed image technology connected to a series of computer workstations. Animated simulation models were developed to understand the old and new reject repair processes. The simulation models have provided very valuable insights about the check-processing operation. For example, bottlenecks, waiting times and productivity data for various operating scenarios have been able to be identified. This paper provides a general description of the simulation modeling approach employed.

**Text:**

Rohit Verma: DePaul University, Chicago, Illinois, USA

Gerald D. Gibbs: First Chicago NBD Corporation, Chicago, Illinois, USA

Richard J. Gilgan: First Chicago NBD Corporation, Chicago, Illinois, USA

ACKNOWLEDGMENT: Rohit Verma would like to acknowledge the financial support and resources provided by the First Chicago/NBD Corporation for this study. He would also like to acknowledge the research support provided by the Dean, College of Commerce (Technology Innovation Grant), and the Chair, Management Department (funds to purchasing ServiceModel) of DePaul University, Chicago, during the summer 1998.

Introduction

The financial services industry is currently going through a major paradigm shift because of deregulation, cheap and easy access to information technology (e.g. Internet, e-commerce), and because of changing customer needs and preferences. Therefore during the last few months an increasingly large number of commercial and investment **banks**, insurance companies and financial services brokers have either initiated or proposed a wide variety of new services to their customers. While successful marketing offers a financial services package that appeals to the needs and desires of a particular segment of customers, this effort is futile without the ability to efficiently manage, control and improve the procedures which deliver those services. Therefore, **banks** and other financial institutions are also spending considerable money, time and effort reevaluating, redesigning, automating and improving the efficiency of their current operations.

In this paper, we describe steps undertaken by one of the largest commercial **banks** in the USA to upgrade and redesign check-processing operations at their central facility in Chicago. This facility processes approximately three million checks during each 24-hour cycle. The monetary amounts on each check vary from a few dollars to several million and on average a total over $3.0 billion daily. Therefore, the efficiency of this central check-processing operation is of utmost importance to the corporation. In addition, it is essential that check-processing complete its daily work in a timely manner so that customer accounts can be posted and on-line balance information updated for branch operations.

We provide an overview of current check-processing operations and describe steps taken to improve the reject repair process (focus of this paper). The current reject repair process is very labor-intensive and has been replaced by an automated process based on high-speed image technology connected to a series of computer workstations. We developed animated simulation models to understand the old and new reject repair processes. We believe that the simulation models have provided very valuable insights about the check-processing operation. For example, we have been able to identify bottlenecks, waiting times and productivity data for various operating scenarios. In this paper, we provide a general description of the simulation modeling approach employed.

Why use animated simulation models?

Owing to recent advances in computer simulation programs, it is becoming relatively less difficult to graphically model and evaluate alternative process configurations (Bateman et al., 1997, Chase et al., 1998; Fitzsimmons, and Fitzsimmons, 1998). For example, a graphical simulation model of a **bank** branch can demonstrate the impact of adding one or more tellers, and/or an ATM machine to reduce customer-waiting times. Simulation allows managers to evaluate multiple service designs and perform "what-if" types of analyses (Law and Kelton, 1991). It can also be used to evaluate the impact of any changes in operating or marketing strategies of service firms (e.g. the impact on checkout queue sizes when marketing promotions are introduced) (**MicroAnalysis** and Design Software, 1993). Managers can use computer simulation to determine the best way of controlling the flow of customers and materials and to find the most

effective way to schedule and deploy resources. Simulation replaces the wasteful and often-unreliable practice of setting management policies based on trial-and-error methods.
Simulation has been used for the past two decades in actual commercial applications and in classrooms. During the DOS and mainframe-computing era, programming languages (e.g. FORTRAN, C, C++) were used to develop simulation models. Generally, programming even a simple model required several hours (often months) of development time. Although very sophisticated and detailed, these programs had either limited or no ability to graphically display the models. During recent years a number of graphical simulation programs have been developed which attempt to reduce model development time. XCELL is an excellent example of one of the first widely-used graphical simulation-modeling programs (Conway et al., 1990).

More recent simulation programs are relatively easy to use, display information visually, and do not require advanced knowledge of computer programming languages. They do, however, require an understanding of simulation modeling concepts, logic and statistics. Fast desktop computers now allow users to run even a very complicated model within a few minutes. Simulation users can visually analyze time series data during the simulation run or view the summary statistics after the run (e.g. queue size in a **bank**, call **center**, or Internet service provider).

ServiceModel (PROMODEL Corporation, 1997), a leading simulation program, allows users to design virtually any service process and graphically evaluate performance over time. Users can decide the layout of the service process to be simulated, customer arrival rates (including market segments), the number and schedule of service providers, capacity, resources, and other service attributes. Based on requirements and model assumptions, users can re-design various alternatives and run the model for several hours/days/months of real time within minutes of simulation time. Because of relative ease of development, analysis and visualization, we used ServiceModel to simulate the check reject repair process.

Simulation illustration: check-processing operations

Efficient check processing is essential to the operations of all commercial **banks** in the USA. Typically, checks written/collected by customers (individuals, businesses, other **banks**) are deposited at **bank** branches, ATM machines and other authorized locations. These **deposits** are transported to a central **check**-processing throughout the day. An overview of the check-processing operation analyzed in this study is shown in Figure 1.

**Deposits** contain varying numbers of **checks** that are either pre-encoded or need manual encoding. Encoding magnetically stores information on the check (e.g. amount, account number, and **bank**). (This process will be referred to as "encoding" or Magnetic Ink Character Recognition (**MICR**) encoding throughout the rest of this article.)
After encoding, **deposit** tickets and **checks** are placed in trays, separated into batches by header cards and sent to the high-speed sorting operation. High-speed sorters are million dollar machines, which separate checks by different sort keys, e.g. account number, **bank**

routing number, etc. Generally, each check passes through the high-speed sorters multiple times.

During high-speed sorting a number of checks are rejected because they are not readable by the machine. There can be several reasons why the sorter is unable to read a check. For example, the check may have been damaged, or improperly **MICR** encoded. Rejected checks are combined into batches of varying sizes and sent to the reject repair unit. As mentioned earlier, the reject repair process is the focus of this paper. Figure 2 shows a simplified diagram of the old and new reject repair processes.

The current check-reject repair process

The current reject repair process is a simple two-step operation. The first step (PREP) involves opening each batch of checks and manually affixing a strip to each check. Up to 20 employees perform this function throughout the day. The checks are then sent to an operator-assisted semi-automatic process (ENCODE - eight parallel stations), which print the **MICR** encoded information on the newly affixed strip.

Since most of the work in this department was performed manually, processing speed is relatively low which leads to delays and long queues. Additionally, processing speed varied a lot because of productivity differences among employees. The net result was huge backlogs of unrepaired checks would develop frequently in the reject-repair unit.

The redesigned check-reject repair process

Although fast, the new reject check-repair process is more complicated. As displayed in Figure 2, the new process is comprised of four steps. The first step (PREP - three parallel stations) is similar to the old reject repair process but is considerably faster (approximately 1,500 checks per hour). After PREP, each batch of checks along with its control documents is run through one of two high-speed

**check** transports, which creates an electronic **image** of each **check** and captures the **MICR** information on the checks.

During the first pass, checks are read both optically and magnetically. If the system gets an acceptable, it will encode the item and pocket it for reentry into the check-processing system. Because of optical resolution and **MICR** quality problems, 50 per cent of the checks must be repaired by a data entry operator at an image workstation (12 parallel stations). After being repaired logically, the items, are put back through the high-speed check transports, which encode and pocket them for reentry into the check processing system. In summary, the new reject repair process is relatively more complex and requires several additional steps. At the same time, because of automation and optical character recognition, the new process should be much faster than the old process.

Based on process data collected from the current process (in operation when this study was conducted) and manufacturer's specifications for the new process, we developed two simulation models. The rest of the paper

describes the models and results.

## Simulation model development

It is generally not possible to include all features of a real system in any simulation model. It is also important to realize that a model is only an abstraction of reality. Therefore, models should include all essential and relevant elements of the real system and leave the non-essential elements out. Using these guidelines, and based on real process data, we modeled the current and new check reject-repair processes.

### Model parameters

In order to develop realistic models, we first collected actual process data for several days to estimate various model parameters and input distributions. The mainframe computer tracks of batch sizes and arrival and departure times at various check-processing stations. Therefore, the task of identifying input parameters was reduced to going through several pages of mainframe computer output and recording relevant information for each job (e.g. location, size, arrival times, departure times).

Checks rejected from the high-speed sorter operation are combined into jobs and delivered to the reject repair unit in trays. The number of checks in each job (INBAG) is not fixed. Additionally, check volume at the high-speed sorters (which operates 24 hours a day) also changes throughout the day. However, these distributions were found to be statistically similar for each data collection day. Figures 3 and 4 show typical job sizes and arrival time distributions.

On average, approximately 225 jobs arrive in the reject repair unit each day. The processing time per job at the prep station for the old process was approximately normally distributed with a mean of 129 minutes and a standard deviation of 30 minutes. After prep is complete, checks are recombined into another job with varying numbers of checks per tray. Figure 5 shows the typical job size distribution after the prep operation. The encoding process can process approximately 6,000 checks per hour.

The PREP station for the new process is expected to take only 9.6 minutes per batch with a standard deviation of three minutes whereas the high-speed image capture machine can scan approximately 8000 documents per hour. Each **image** data entry workstation can process 1,000 **checks** each hour.

### Simulation models

Based on the identified input parameters and process logic (briefly explained) two models were developed using ServiceModel. Figure 6aFigure 6bshows screen-prints of the models and the lists below describe the simulation logic.

Old reject check repair process: simplified simulation steps

(1) INBAG arrive according to INTIME (Figure 4) distribution. Approximately 225 jobs per 24 hours.

(2) INBAG transferred to the queue Q1.

(3) INBAG transferred to available PREP station. INBAG opened as CHECK according to ARRSIZE distribution. Processing time at PREP: Normal distribution with average 129 minutes standard deviation 30 minutes.

(4) Individual CHECK transferred to the queue Q2. CHECK grouped as BOX according to BOXSIZE distribution. BOX transferred to the available ENCODE station.

(5) BOX opened as CHECK. Processing time average 6,000 checks per hour.
(6) Processed CHECK transferred to queue Q3 and then EXIT (back to sorter).

New reject check-repair process: simplified simulation steps</ST

(1) INBAG arrive at DOOR according to INTIME distribution. Approximately 225 jobs per 24 hours.

(2) INBAG transferred to the queue Q1.

(3) INBAG transferred to available PREP station. INBAG opened as CHECK according to ARRSIZE distribution. Processing time at PREP: Normal distribution with mean 9.6 minutes. And standard deviation three minutes. One set of 70 documents (P1DOC) added to CHECKS from INBAG.

(4) INBAG+P1DOC transferred to queue Q2 and then to HIGH SPEED **IMAGE** CAPTURE. Processing speed 8,000 **checks** or documents per hour.

(5) 50 per cent of CHECKS go to queue Q3 and then EXIT. P1DOC documents EXIT.

(6) 50 per cent of CHECKS are combined into REJECTBAG and transferred to queue Q3, then to the available **IMAGE** DATA ENTRY station.

(7) REJECTBAG opened as **CHECK**. A set of 70 documents (P2DOC) created. Processing time for each CHECK: 0.06 minutes.

(8) CHECK combined into PASS2BAG and transferred to HIGH SPEED IMAGE CAPTURE along with P2DOC. Processing speed 8,000 checks or documents per hour.

(9) CHECK and P2DOC transferred to EXIT.

Results

The ServiceModel data analysis module can track time-series data for all entities, locations and model parameters. Figures 7 and Figure 8 show summarized results for both the current and new processes. As expected, PREP stations (manual operation) in the current process are being utilized at close to 100 per cent capacity. This leads to increased waiting time at queues Q1 and Q2. Figures 7 also shows the waiting time patterns for these two locations. Observations of the actual process produced results very similar to output from the simulation model. There was always a big pile of input jobs before PREP stations, whereas ENCODEing stations were

underutilized.

Summary results for the new reject repair process are presented in Figure 8. Since automated PREP stations are now only utilized approximately half the time, there is almost no queue buildup. Even though 50 per cent of the checks require two passes through the high-speed check transports, these machines are utilized only about one-fifth of the time. The image data entry workstations are utilized at a very minimal level.

Lessons learned and future work

This study demonstrated the value of animated simulation in the design and improvement of complex service processes. Data collection, model development, and analysis for the simulation exercise described in this paper were completed within one month. We successfully modeled two versions of an important **banking** process. During this project we developed valuable insights about the check reject repair and simulation modeling processes.

When the project started, the simulation exercise was perceived to be easy by one of the authors of this paper. However, this view was found to be completely wrong as soon as the process flows (Figure 1 and 2) and simulation logic were thoroughly analyzed. One especially challenging feature of this simulation exercise was to develop a model where the moving entities (jobs and individual checks) are combined, separated and recombined during the process. Fortunately, ServiceModel contained modules for keeping track of such changes in simulation entities. Otherwise modeling this process would have been extremely difficult and time-consuming.
We believe that developing these two models is the first step in a scientific approach to process improvement. The models have generated several questions, which should be looked at and analyzed for further improvement. For example, fixed and variable costs are not part of the modeling process. Similarly, it is assumed that the numbers of employees at different processing locations stays constant throughout the day/week. Similarly, we have not considered the impact of different labor schedules, or workload distribution changes on various operating parameters.

ServiceModel comes with an optimization and experimental design program SimRunner that can be used to test if changes in certain input parameters impact selected output measures. SimRunner can conduct full or fractional factorial experiments with multiple attributes with user-defined objective functions. The optimized regression models can estimate both the main effects and interaction affects among input variables on the objectives. The estimated equations can be easily incorporated into spreadsheet-based decision support systems for use in day-to-day management and decision making.

In summary, we believe that animated simulation modeling is a very valuable tool for **banking** and other service industries. Animated models visually display the characteristics of service processes and provide managerially-useful information. In addition, development time using current graphical simulation modeling programs (such as ServiceModel) is also very reasonable (i.e. few days). This makes it possible for business

organizations to use such models as day-to-day management tools.

References

1. Bateman, R.E., Bowden, R.G., Gogg, T.J., Harrell, C.R. and Mott, J.R.A. (1997), System Improvement Using Simulation, PROMODEL Corporation, Orem, UT.

2. Chase, R.B., Aquilano, N.J. and Jacobs, F.R. (1998), Production and Operations Management: Manufacturing and Services, 8th ed., Irwin/McGraw-Hill, Boston, MA.

3. Conway, R., Maxwell, W.L., McClain, J.D., and Worona, S.L. (1990), XCELL Factory Modeling System, Version 4.0, 3rd ed., Scientific Press, San Francisco, CA.

4. Fitzsimmons, J.A. and Fitzsimmons, J.A. (1998), Service Management: Operations, Strategy and Information Technology, 2nd ed., Irwin/McGraw-Hill.

5. Law, A.M. and Kelton, W.D. (1991), Simulation Modeling and Analysis, McGraw-Hill, New York, NY.
6.

**MicroAnalysis** and Design Software, Inc. (1993), "Hospital overcrowding solutions are found with simulation", Industrial Engineering, December.

7. Promodel Coroporation (1997), ServiceModel: The Standard in Service Modeling, Version 3.5, Software and Users Model, Orem, UT.

Caption: Figure 1.; Check-processing workflow schematic; Figure 2.; Reject check-repair process; Figure 3.; Number of checks per arrival batch; Figure 4.; Arrival time distribution; Figure 5.; Number of checks per job prior to encoding; Figure 6a.; Old reject check-repair process simulation model; Figure 6b.; New reject check-repair process simulation model; Figure 7.; Summarized simulation results for the current process; Figure 8.; Summarized simulation results for the current process

**THIS IS THE FULL-TEXT.**



**Geographic Names:** United States; US

**Descriptors:** Simulation; **Banks**; Check processing; Automation; Studies; Statistical analysis
**Classification Codes:** 9130 (CN=Experimental/Theoretical); 8100 (CN=Financial services industry); 5240 (CN=Software & systems); 9190 (CN=United States)
**Print Media ID:** 46160

11/9/2 (Item 2 from file: 15) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT ProQuest
ABI/Inform(R)

00616425 92-31527
**How Technology Is Changing Banking**

Gart, Alan
Journal of Retail Banking v14n1 pp: 35-43
Spring 1992
**ISSN:** 0195-2064 **Journal Code:** JRB
**Document Type:** 02 **Language:** English **Length:** 9 Pages
**Word Count:** 5123

**Abstract:**

While new technology has made most financial transactions quicker, more convenient, more accurate, and less expensive, automation has also increased customer demand for convenience and accessible information. Online corporate databases, spreadsheet packages coupled with powerful computer networks, and wide-ranging telecommunications facilities now provide potential investors with essentially the same timely credit and market information that was once the exclusive domain of **banks**. In-house information systems allow customer service and recordkeeping of total account relationships to be online at the teller or officer terminal. Commercial **banks** are relying on electronic funds transfer systems to reduce the costs of processing payments.

**Text:**

The information revolution in computer and telecommunications technology has had a major impact on the financial services industry. The cost of computer memories, telecommunications, and electronic processing has declined dramatically since the 1960s. Today's personal computers are 25 times faster and less than one-hundredth the cost of an IBM 650 in 1960. What cost a dollar to record and process in 1960 costs less than 5 cents in 1990.

New technology has made most financial transactions quicker, more convenient, more accurate, and less expensive. At the same time, automation has increased customer demand for convenience and accessible information--for both institutional and retail cash management, government electronic funds transfer (EFT), and automated teller machines (ATMs). Before deregulation, depository institutions could not respond to rising demand for these and other services because of legal restrictions. For example, Regulation Q interest rate ceilings interfered with the introduction of competitive retail cash management services for individuals

by **banks** and thrifts, while securities firms (not bound by interest rate restrictions) were free to pioneer and market them. The Cash Management Account, a Merrill Lynch innovation, offered a money market account, a credit card, a line of credit, check-writing privileges, etc.

Technological advances increased the variety of financial services and lowered barriers to entry by nonfinancial companies. **Banks**, traditionally the sole providers of transaction balances and cash management services, have now been joined by brokerage firms, investment companies, and insurance companies in these duties because of technological advancement in the rapid transfer of funds. The development of computerized push-button telephone access information systems and the widespread availability of the 800 telephone number have made consumers less concerned about keeping their money in money market accounts or mutual funds at great distances from their home. These changes have reduced the market share of commercial **bank** deposits in the economy.

On the commercial lending side, immediate computer accessibility to current information on the world's largest corporations has made it feasible for many of these firms to bypass lending intermediaries, borrowing directly (through commercial paper) in the money markets at lower interest rates than they would have to pay **banks**. This has seriously reduced the traditional commercial **bank** market for business loans, forcing them to seek other, usually riskier, customers.

DECLINE OF INTERMEDIATION

On-line corporate data bases, spread sheet software packages coupled with powerful computer networks, and wide-ranging telecommunications facilities now provide potential investors with essentially the same timely credit and market information that was once the exclusive domain of the **banks**. Technology is making once exclusive market information and powerful, inexpensive software available instantaneously to anyone with a terminal. These advances aided the development of the commercial paper, junk bond, and asset-backed securities markets in the 1980s. It is now easier in many cases for institutional investors to evaluate credit risk themselves and to deal directly with borrowers. The process of intermediation--the core of a **bank**'s comparative advantage and its major contribution to the economic process (credit evaluation and the diversification of risk)--has been decreased in value by this information revolution that provides information on credit risk at minimal cost. Lower transaction costs plus regulatory and economic forces favor direct credit markets rather than transactions through depository institutions. The movement toward direct financing as opposed to financing through intermediaries has been facilitated by the regulatory taxes that depository institutions must pay relative to other financial firms. **Banks** must hold noninterest-bearing reserves against domestic deposits and hefty capital requirements that exceed those which would exist in the absence of regulation.

To provide a more level playing field, the Federal Reserve has recently lengthened the laundry list of permissible **banking** activities by allowing strong **bank** holding companies, such as J.P. Morgan, to

underwrite and distribute equity securities. The Federal Reserve had already allowed **bank** holding company subsidiaries to underwrite all debt securities in the money and capital markets. These underwriting activities had not been permitted under previous interpretations of the Glass-Steagall Act.

Major money-**center bank** holding company subsidiaries now underwrite commercial paper, revenue bonds, mortgage-backed securities, consumer-loan-backed securities, as well as corporate bonds and government and agency securities. The corporate underwriting activities of **banks** have contributed to lower underwriting costs for corporate issuers and provided additional sources of much needed fee income for **banks**. Underwriting activities should strengthen **banks**, permitting them to compete more effectively in their natural markets. In a framework that provides safety walls to insulate the **bank** depository function from its securities affiliates, broader securities activities of **banking** subsidiaries should provide important public benefits without impairing the safety and soundness of commercial **banks**. Technology also had enormous influence on financial innovation and regulatory reform during the 1980s. The demands from **banks** and thrifts for the right to diversify products and services and to deregulate interest rates and loosen geographical constraints became increasingly forceful as technology brought increased competition from new entrants into the financial services industry. Regulation Q ceilings appeared antiquated even in the late 1970s. According to Henry Wallich, then a member of the Board of Governors of the Federal Reserve, "Deregulation has been driven...by technological innovation. Anticompetitive practices have had to be abandoned on pain of being circumvented, bureaucratic restraint had to yield to the pressures of the market."

GLOBALIZED MARKETS

Deregulation in the U.S. and abroad, as well as technological innovation, has acted as a catalyst in facilitating the globalization of capital markets and the growth of foreign investment in this country. These developments have increased arbitrage opportunities arising from inefficiencies caused by domestic controls, regulations, and taxes. Some central **banks** and governments have responded by dismantling increasingly less effective domestic regulations designed to allocate credit and by removing controls on international capital flows, relying more heavily instead on market forces to allocate capital.

SHIFTING RISK

Many of the financial services offered by **banks** (e.g., adjustable-rate mortgages, variable-rate loans, interest rate and currency swaps, financial futures and options, mortgage-backed securities) would be impractical or impossible without the advances in both computer software and hardware. These products and innovations are part of a broad spectrum of new, complex financial instruments that can be tailored to the hedging, funding, and investment needs of a growing array of market participants. Some of this activity has involved an unbundling of financial risk to meet the increasingly specialized risk management requirements of market

participants and has become an important means by which currency and interest rate risks are shifted to those parties willing to bear them. **Banks** have also enhanced customer services with improved cash management and lockbox techniques, as well as global electronic wholesale **banking**--fee-based, information-intensive financial services processed electronically and delivered to institutional clients worldwide. On the retail **banking** front, ATM networks and POS (point-of-sale) terminals have grown rapidly. ATM growth has permitted **banks** to shorten teller service hours and to build smaller and fewer branches. ATMs, with higher investment costs but lower operating costs than human tellers, represent an efficient way to deliver transaction services at high-volume locations. Although still in its relative infancy, EFT is growing rapidly and is likely to become the dominant payment system of the future, especially for larger and repetitive types of transfers. Legal impediments hampered the development of EFT initially. There were questions concerning (1) the legality of operating remote units in places where a **bank** branch was prohibited and (2) the relevance of antitrust statutes to shared ATM networks.

EFT can move funds and information more quickly and at lower costs than paper-based check systems. Such advances not only reduce the amount of human physical effort required in making financial transactions across national borders and between domestic

**banks**, but allow these transactions to be executed with more accuracy, speed, and ease. Although we are unlikely to have a checkless society in the United States, EFT is at least helping to reduce the reams of paper that have historically accompanied financial transactions in the United States.

Technological advances in telecommunications and computer technology have transformed regional markets into national markets, and national markets into international markets. These advances also permit instantaneous record maintenance and transmission of information. Daily international capital movements larger than the GNP of most nations have become routine as a result of the speed, reliability, and pervasiveness of information processing technology. Computers now direct multibillion-dollar program trading systems in equities, futures, and options markets around the world. Advanced telecommunications and computer systems help currency and bond traders operate 24 hours a day from outposts on every continent.

THE RETAIL FALLOUT

The computerization of the platform functions and direct customer interface have changed the nature of retail **banking**. In-house information systems allow customer service and recordkeeping of total account relationships to be online at the teller or officer terminal. Customers can also interface through a terminal directly to internal systems and can process their own inquiries. In many **banks**, the transaction accounts, time deposit accounts, and loan accounts are integrated via a common software architecture and are built around a single central information file. These systems allow **banks** to track entire customer relationships, provide faster customer service by eliminating some

paperwork, meet compliance requirements and reports, help generate new business, and deliver more timely, accurate, and comprehensive data to support decision making. The software systems allow new products to be added to the system and the central information file.

Before we discuss the latest developments in ACHs, ATMs, POS terminals, and credit and debit cards, we will examine a number of new products such as image processing, smart cards, home **banking** services, and videotex systems and their impact on the **banking** industry.

**IMAGE** PROCESSING--At many **banks**, **check** processing equipment is approaching replacement age. These **banks** are considering replacing the old equipment with computers using image technology, an offshoot of NASA research. Image processing uses optical scanning systems to produce digitized images, which are captured, stored, and transmitted electronically.

**Image** processing can be used to convert **checks**, **deposit** slips, loan applications, credit card receipts, and other paper documents into a digital file that can be manipulated, stored, retrieved, and displayed at a moment's notice on video terminals. An **image** of all the **checks** written by a customer can be reproduced and mailed to a customer in a manner similar to the way that American Express sends their credit card customers reduced facsimiles of their original charge receipts each month. The reduced forms are not photocopies, but digitized electronic images printed on the billing statement. In an opinion survey conducted by a subsidiary of the American **Banker**, consumers indicated their preference for copies of checks produced by imaging systems over the original checks that are returned with most monthly checking accounts. **Image** processing of **checks** would generate savings on postage, since the checks themselves would be truncated, not returned to the issuer. Additional advantages of image processing include better and faster service, increased productivity, improvements in quality, more accurate records, quicker transactions, reduction in paper use and flow, reductions in float, large savings in floor space for storage and personnel, and fewer accounting and human errors. The potential for float reduction lies in faster collection and processing and in error reduction. However, the largest cost savings are likely to come from reductions in staff stemming from increased productivity.

Image processing has reduced the assembly line process from nine to three steps for **bank** lockbox customers. At one Pennsylvania **bank**, the need for 3,000 square feet of files was reduced to 100 square feet in the student loan operation alone. At some **banks** image processing is seen not merely as a way to eliminate paper, but as an aid to managers of labor-intensive operations. Converting mountains of paper-based information into electronic form that can be easily processed, communicated, and stored is already delivering competitive advantages to companies such as American Express and Chemical **Banking**. At Chemical, image technology has boosted productivity 75% in the customer service area of the credit card operation. Customer service is among the areas where imaging should provide a competitive edge. "Handling requests quickly through a single transaction

not only makes for happier customers, it also provides customer service people with a powerful sense of accomplishment," according to Lawrence Matteson, a senior officer of an Eastman Kodak subsidiary.

IMAGE PROBLEMS

Although image processing has been used commercially for at least a dozen years, its widespread adoption in **check** processing, proof of **deposit**, and other branch applications has been slowed by the investment required and the risk in making dramatic changes in high volume systems. It now appears that the economics of investing in a new computer, software, and an image module should be favorable for moneycenter and large regional **banks**, but remain an uncertain benefit for smaller **banks**.

Potential imaging problems include a lack of compatibility in transferring image data from one **bank** system to another, the lack of an industry standard, and the resolution of two important issues:

1. Will **check images** be accepted as legal documents in court?

2. Is the image secure or can it be altered?

Under a nonimage system the amount to be paid by check is keyed in and encoded directly on the check with magnetic ink. The checks are then proofed and sent to the reader/sorter for distribution. The checks are passed from one operator to another throughout the process in a time consuming manner that is prone to human error. In the **image** processing system, **checks** are processed though a reader/sorter which produces a digital image. There is little paper movement because employees work from images on screens. The **bank** can read the magnetic ink first and set priorities for processing checks. The big money-saving potential comes from the ability to process quickly the highest-priority checks, which will put money to work for the **bank** more quickly. For example, the **bank** can process checks drawn on accounts whose owners generally write large checks first or can segregate checks drawn on the **bank** itself or any other **bank** that it chooses, cutting by 30% to 50% the volume of items keyed and proofed in the critical initial step. It can also handle customer inquiries concerning specific **checks** rather rapidly.

**Image** technology is also being implemented in a variety of retail customer-service functions, such as providing timely answers to telephone inquiries on mutual fund account status, tracking trading tickets, international wire transfers, stock certificates, personnel records, and compliance-related documents.

SMART CARDS--A smart card, containing **microelectronic** chips with memory capacity mounted in a piece of plastic, can act as a credit card, debit card, or portable computer. The least sophisticated cards might consist of little more than a simple processor and a small memory. The card could serve as a complete medical, insurance, or automobile service history.

Future cards will be able to store digitized versions of their owners' signatures, retina prints, or fingerprints. They will be able to serve as highly secure keys, allowing access to telephone networks, secure buildings, and corporate data bases. Unlike current credit cards, which store information on a magnetic strip and are easy to read, alter, and forge, smart cards protect the information they carry with a secure electronic lock.
Despite its growing popularity abroad, the smart card has not made much headway in the U.S. **banking** industry. In most European countries where the smart card has been adopted, consumers did not have a prior dependence on credit and debit cards. The largest domestic user of the smart card is the U.S. Department of Agriculture for food stamp issuance. An immediate switch to smart cards by **banks** is unlikely.

Because of recent **bank** investments in magnetic cards, readers, and software, it is too costly to replace traditional credit and debit cards with smart-card technology right away.

COSTLY SMARTS

The proponents of smart cards as a substitute for debit and credit cards expect major reductions in **bank** credit card losses and lower communication costs. This is because smart cards carry enough information for terminals at retail outlets to make off-line credit decisions. Smart cards help eliminate credit card authorizers and problems of overcharged accounts. Opponents, however, point to the higher production costs of smart cards and the fact that data entry onto the card is slow and laborious. Not only are the cards themselves expensive, but the infrastructure needed to support them requires a large investment. In addition, hundreds of thousands of retailers in the U.S. would have to be equipped with expensive terminals capable of reading the data stored in the smart card in order to accept this means of payment.

Smart cards are used as a substitute for paychecks at the U.S. Marine Paris Island training base. On pay day, recruits receive a chip-based card rather than a check or cash, which prevents them from spending beyond a set limit. The cards have a memory and automatically deduct purchases from the embedded spending limit.

Smart cards are appearing in an increasing number of applications, including electronic instrumentation process control, diskless computers, and reconfigurable intelligent peripheral devices, such as printers and POS terminals. These cards are dedicated to a specific task, such as financial transactions, security control, or manufacturing. They are designed to work with card readers that are hooked into a computer network. In essence, they are essential pocket-sized personal computers that are changing the way corporations and individuals do business. Smart card technology lends itself to applications that require the installation of a small number of chip-reading terminals, such as a security system in

**bank** wire
transfer rooms, where only a few terminals would be required to protect millions of dollars worth of transactions. Also, the Thomas Cook Group is

developing a 64K-bit smart card capable of replacing traveler's checks and cash advances to help business travelers reduce their paper and record-keeping loads. The card is similar to a hand-held calculator and depends on a battery-powered reprogrammable memory.
A research arm of Bell Communications has developed a computer chip in a card that recognizes its owner's voice and carries out commands. In a given situation, the user would insert the card into a system verification terminal. Name, speech template, special commands, and billing information would be sent immediately from the card to the computer. The cardholder would then say a password, which would be translated into digital form.

HOME **BANKING** AND VIDEOTEX SYSTEMS--Two types of home **banking** arrangements are available to the American public. One requires just a push-button telephone, while the other requires a home computer and a modem. Commercial **banks** have continued to support home **banking** (despite its limited success here) in order to reduce traffic in branches, gain fee income, enhance existing relationships, attract new customers, and for defensive purposes. Also, the typical home **banking** customer has nearly five accounts, compared with only 1.7 for the average **bank** customer.

Home **banking** systems allow people to check their account balances, pay bills to cooperating merchants, and transfer funds among accounts. Home **banking** by telephone did not live up to expectations because the most popular transactions--withdrawing cash and making deposits--were not possible. Computer-based videotex systems allow all of the home **banking** services available by phone, plus options for budgeting, organizing tax records, access to information networks on stocks and bonds, weather reports, travel schedules, current news and sports, and home retail and food market shopping. Videotex systems can be used for retrieval and transactional services, or the personalization of information.

Two-thirds of European **banks** currently offer home **banking**, a percentage expected to increase to 90% by 1992. On the other hand, only 340 U.S. **banks** offered telephone bill paying or home **banking** in mid-1988 out of some 12,000 **banks**.

Home **banking** systems should become more visible in the U.S. now that Sears and IBM have jointly offered Prodigy, an improved videotex system with a home **banking** option.

Videotex grew out of "viewdata," a two-way service distributed by telephone or cable networks, offering access to textual information that could be displayed on a television screen modified by a modem. Videotex systems are no longer restricted to television receivers, but include personal computers. Color and graphic enhancements have improved the textual systems. In addition, the proliferation of specialized data bases targeted to the needs of specific business segments has shifted the emphasis from the consumer to the business user.

Why did videotex systems fail as a commercial enterprise in the 1980s when they had the support of Knight Ridder in southeastern Florida; Times Mirror in Southern California; Honeywell, Centel, and Field Enterprises in

Chicago; and Chemical **Banking** in New York? The principal reasons are related to the lack of a government standard or any financial support, leading to a high break-even point, limited consumer benefits, technological limitations that included poor picture quality and slow screen changes, the lack of training in system use, mediocre documentation, poor marketing strategies, the high initial cost of a dedicated computer, as well as high hookup and user fees. In addition, most of the original applications offered to the subscriber were available elsewhere (e.g., in newspapers or by telephone) and cheaper. Consumers were never asked what they wanted on the system or how much they would pay for it.

One reason videotex systems have been more favorably received in England and France than in the U.S. is government standardization of the underlying technology and financial support. In France, the government distributed four million personal computers to Parisians to establish a on-line telephone directory instead of printing the first edition of the "white pages." In England, the Prestel system was supported by British Telecom and the British Post Office as part of a drive to increase usage rates in telephone networks and electronic mail.

Why then have Sears and IBM committed millions of dollars to develop a videotex system in the United States? (An initial third partner, CBS, withdrew from the development in 1986.) Obviously, the two corporate giants are betting on an improved system, the growth of personal computer sales, their marketing prowess, and reasonable monthly charges. As a matter of fact, the price of a Prodigy subscription is subsidized by advertising revenues. Advertisements appear continuously on the bottom of the screen like a moving stock market ticker tape. The Prodigy system has simple user instructions, a better menu set-up, improved graphics, and more applications than previous systems. Many **banks** have placed their home **banking** services on the system. The system does not require a dedicated computer, but it does require ownership of a personal computer. Eight million computers could receive Prodigy in 1989. This number is likely to reach 25 million by the year 2000.

LOOSE WIRE

Commercial **banks** are relying on ACHs, ATMs, POS terminals, and other forms of EFT systems to reduce the costs of processing payments. EFT systems incorporate computer-based technology to record transactions and transfer funds between parties. There are three major wholesale electronic payment systems: Fed Wire and CHIPS (Clearing House Interbank Payments System), both of which are wire-based, and automated clearing houses (ACHs), which are electronic. Fed Wire, owned by the Federal Reserve, is the largest wholesale EFT network in terms of transaction volume and number of users. CHIPS, operated by the New York Clearing House, is the second largest wire transfer network, handling the dollar settlement of foreign ordered payment transactions. Wire payment services offer virtually instantaneous transfer of payment data by a two-way, telephonelike, communications network. Wires are used when fast transfer or confirmation are appropriate. However, wires are unlikely to replace checks because they cost more.

Gerald Corrigan, New York Federal Reserve **Bank** president, has warned

about problems with the electronic payment mechanism, noting (1) A sizable percentage of these payments take at least a few hours before payments are final. Hence, some institutions may be at risk if serious problems arise, and (2) the speed and 24-hour-a-day worldwide nature of markets make it inevitable that large amounts of credit risk are incurred in the process of making and receiving payments.

Large dollar payments systems can entail considerable systemic risk (the risk that one participant's settlement default will trigger a chain reaction, resulting in many interdependent transactions being unable to settle). To control this risk in CHIPS, participants (effective late 1990) are required to guarantee transactions by posting about $4 billion in collateral to cover default by system participants. In contrast, the Federal Reserve's offer of immediate payment on Fed Wire transfers precludes systemic risk since the Federal Reserve System takes all of the risk responsibility itself. In order to share the risks with the user **banks**, the Fed is proposing a 0.25% annual interest rate fee on the intraday Fed Wire overdrafts that exceed 10% of a **bank**'s risk-based capital. This fee should give Fed Wire participants an incentive to reduce their daylight overdrafts and thereby shrink the risk exposure of the Federal Reserve. The large dollar electronic payment mechanism that has evolved over the last decade has certainly made financial markets more interdependent and more vulnerable to credit and liquidity problems.

AUTOMATED CLEARING HOUSES--By the 1970s, the anticipated annual volume of paper checks to be used in the 1980s far exceeded the capabilities of the existing processing systems. This forecast led to the formation of ACHs, which are private processing systems formed by **banks** to exchange information by magnetic tapes and to encourage the electronic processing of pre-authorized debits and credits. The ACH is an electronic payment alternative to checks that uses storage and forward communications systems. Transactions can be batched together and processed as a group. This cost saving feature allows for "load smoothing" and the use of data transmission lines over time, since the message can be stored or queued.

The ACH can be viewed as a special-purpose, cost-effective, high-volume electronic mail system which transmits payments and related information. The federal government promotes the direct deposit of Social Security and pension payments and encourages their employees to accept this form of payment. With the U.S. Treasury as its major user, the ACH is credited with replacing about 3% of the close to 50 billion checks written yearly in the U.S. Just under 40% of all Treasury payments are electronic transactions, which translates into just over 305 million annual payments. If the annual growth rate holds steady, ACH volume should reach 6 billion transactions by 1995. As of 1990, only 10% of 109 million Americans in the work force received their pay by direct deposit, leaving much potential for direct deposit expansion.

There were 42 ACHs in the late 1980s serving 17,500 financial institutions and 34,000 nonfinancial corporations. The federal government is currently the largest user of ACHs, but ACH use has begun to grow substantially as financial institutions and their commercial customers move to cut costs and improve their cash management. In addition, consumer acceptance of electronic credits and debits is increasing.

The cost savings to

**banks** from check displacement are considerable. Increased use of ACH should generate more timely receivables and reduced operating costs for **banks**. The growing role of the ACH in retail payments has laid the groundwork for national debit card programs sponsored by retailers and other nonbank organizations.

The most popular ACH credit transactions are direct **deposit** of payroll **checks**, dividends, annuities, Social Security and government retirement benefits, corporate trade payments, and cash concentration and disbursements that allow businesses to pay their receivables and collect payments electronically. The most popular debit products are pre-authorized debits of insurance premiums, utility, cable television, and rent payments, mortgage and installment loan payments, and charitable electronic mail deductions, as well as point-of-sale transfers.

There is some resistance from large corporations to the use of EFT in place of checks for accounts payable. These companies could lose one or two days' float on their checks that might amount to millions of dollars in lost interest income during a year. Also, instantaneous debit transactions do not appeal automatically to all consumers unless they are cheaper to use than credit cards or checks.

ATMs and POSTs--Those **financial institution** interested in offering customers EFT in the form of ATMs must decide whether to invest in EFT equipment that can be used only by their customers (proprietary systems) or to initiate or join shared systems. Many smaller **banks** and savings and loans participate in shared ATM and POS systems to save on the high start-up costs. These systems also benefit larger institutions that invested previously in electronic equipment because they earn fee income from other participating financial institutions. Shared systems enable **banks** to enjoy economies of scale in the use of their terminals. By sharing ATMs, depository institutions can increase their use rates, while reducing their average operating costs. These ATM networks also provide a way for **banks** to serve customers outside their local marketing regions.

The number of ATMs grew from under 2,000 in 1973 to over 85,000 in 1990, while the number of POS devices grew from 17,131 in 1986 to 178,000 in 1990. Operating 24 hours a day, ATMs are used to obtain cash, transfer funds from one account to another, make deposits, obtain cash balances, and, in some cases, pay bills. ATMs can be found on **bank** premises, on urban streets, in supermarkets, shopping centers, convenience centers, schools, hospitals, and airports.

ATMs have become global, allowing a American in Tokyo or London to withdraw cash in yen or pounds, make deposits, or move money from one account to another at his or her home **bank** in less than a minute. The globalization of the ATM suggests an eventual decline in the demand for traveler's checks.

Most POS terminals are located in gasoline stations, supermarkets, and retail stores. POS systems permit instant transfer of funds from the user's checking account when the buyer uses an electronically encoded debit card with a confidential personal identification number. The most widespread use of POS is for check and credit card verification. But other functions have also been programmed into the POS terminal. For example, the terminal can be used by a retail shop to keep track of the hours worked by its employees, and transmit the information to the **bank** that produces payroll checks. Gas stations also use POS terminals to keep track of gasoline inventories and to reorder electronically.

Currently, NCR and IBM are trying to build credit card readings and verification into their new cash register machines, thereby doing away with the need for a special terminal. The debit card is also moving beyond the obvious uses to such applications as postage stamp distributions, health claims payments, train ticketing, and welfare benefits transfers.

The **banking** industry is for the most part still dominated by a paper-based brick-and-mortar, customer-**bank**-employee interactive delivery system. Nevertheless, recent technological developments point to a substantive shift away from this system, with EFT displacing the traditional paper-based payment methods. As has been noted, the revolution in delivery systems has important implications for **bank** management decisions.

Alan Gart is a professor of finance at the University of Massachusetts, Dartmouth, Mass.

**THIS IS THE FULL-TEXT.**



**Geographic Names:** US

**Descriptors:** **Bank** automation; Technological change; Impacts; Financial services
**Classification Codes:** 9190 (CN=United States); 8100 (CN=Financial services industry); 5240 (CN=Software & systems)

11/9/3 (Item 3 from file: 15) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT ProQuest
ABI/Inform(R)

00613073 92-28176
**Check Imaging: Banks Are Getting the Picture**

Arend, Mark
ABA Banking Journal v84n5 pp: 44-53
May 1992
**CODEN:** ABAJD5
**ISSN:** 0194-5947 **Journal Code:** BNK
**Document Type:** Journal article **Language:** English **Length:** 5 Pages
**Word Count:** 3030

**Abstract:**

Image-based systems, which reduce the physical handling of paper checks, are now becoming commercially available and are likely to redefine **check** processing. Eventually, full-scale **check image** processing will become a reality, starting with the truncation of the paper **checks** at the **bank** of first **deposit**. Industry vendors and their **bank** partners are putting their finishing touches on more limited **check image** processing solutions, including **image** statements and proof-of-deposit systems. Helping direct some image technology efforts is the Federal Reserve Board, which monitors costs associated with check clearing operations. The Federal Reserve is working with **banks** and vendors to develop systems that can communicate with each other and the standards that make that communication possible. One **bank** that has invested in check imaging technology is Michigan National **Bank**. Michigan National has been working with IBM on image capabilities based on that vendor's image processing platform, ImagePlus High Performance Transaction System.

**Text:**

Image processing technology is emerging from a bumpy adolescence and is showing signs of maturity that have **banks** taking a second look. **Banks** that believed in imaging's potential all along are being rewarded now, because they are among the first to see significant reductions in **check** processing costs. **Image**-based systems, which reduce the physical handling of paper checks, are now becoming commercially available, and in time, they are likely to redefine check processing.

Eventually--probably in this decade--say industry observers, full-scale **check image** processing will become a reality, starting with

truncation of the paper **checks** at the **bank** of first **deposit**. Numerous legal, technical, and financial hurdIes have yet to be crossed, but the potential savings seem to justify a move in that direction.

In the meantime, industry vendors and their **bank** partners are putting the finishing touches on more limited **check image** processing solutions, including **image** statements and proof-of-deposit systems that let proof operators more efficiently encode check amounts, for example.

FED SUPPORT. Helping direct some image technology efforts is the Federal Reserve Board, which monitors costs associated with check clearing operations.

"From my own efforts to update some estimates compiled by two Federal Reserve economists a few years ago, it appears that the industry spends nearly $4 billion each year in the proof-of-deposit function," Paul Connolly, senior vice-president at the Federal Reserve **Bank** of Boston, said at a recent conference. "Using best estimates, the costs for payor **banks** to receive and process their inclearing checks, post the checks to customer accounts, prepare statements, and send statements and cancelled checks to customers, are over $10 billion annually," he added. "These figures certainly suggest new approaches to reducing the labor intensity and paper intensity of the check system could be very cost effective."

The Fed is leading efforts to establish interbank applications of **check image** technology, so that the industry as a whole can benefit from it. But today's image systems don't include key capabilities necessary for interbank applications, said Connolly.

For this vision to be realized even in part, said Connolly, image systems would need to include the ability to store a complete **check image** and to retrieve the **image** and deliver it to another **bank**'s image system.

The fed is working with **banks** and vendors to develop systems that can communicate with each other and the standards that make that possible. "Between now and the end of 1993, we will be conducting tests in Reserve **banks** with high-speed archival systems from Unisys and IBM to test these crucial capabilities," said Connolly. In February, those vendors demonstrated to the Fed their ability to exchange images between different systems. "The quality of the images they produced was very encouraging," says Connolly.

Additionally, the Federal Reserve is working with several industry groups, including the ABA, to develop **check image** interchange standards. The American National Standards Institute (ANSI) initiated a working group early last year to outline the parameters for such standards.

Other organizations are working to streamline the check clearing process as well. An electronic check truncation pilot program was launched in March

involving small corporate checks. That project is sponsored by the National Automated Clearing House Association, the Fed, and the National Association for Check Safekeeping (see "Operations Briefs," p. 84). And the Electronic Check Clearing House Organization, formed in 1990, is promoting electronic check presentment as a means of making the check payment system more efficient.

Is there a common denominator to such efforts? "Given the volume of checks in the system and the number of players in the clearing process, it's natural that everyone doesn't gravitate to the same approach," notes Connolly. "The good news is that the **banking** industry as a whole is looking for ways to make the paper-based system more efficient."

Meanwhile, **banks** are moving ahead with plans to install image technology systems after a period of waiting for major platforms to be announced--and delivered--to the marketplace. Many **banks** have reacted warily to early reports of imaging's perceived benefits, especially because of the high cost of installing such systems. But the **banks** that teamed up with vendors in efforts to develop image systems are that much closer to having imaging platforms in place when interbank **check** clearing does become more **image** based.

IMAGING ADVANTAGES. Besides gaining operating efficiency, **banks** that have invested in **check image** technology are exploiting new marketing opportunities, such as offering new products and services to customers. For example some **banks** that use the technology offer their customers image statements, which eliminate the cost of mailing multiple checks to customers each month.

"The postage savings are enough to defray the investment in the equipment," says Lindsey C. Lawrence, president of BayBanks Systems, Inc., the technology division of BayBanks, Inc., a $9.5 billion-assets **bank** holding company in Boston. A 25-cent fee for the service, which the **bank** calls CheckView, also helps cover the cost of the technology. "But the marketing appeal of image statements is the main reason for offering them," notes Lawrence. Not every **bank** that offers image statements chooses to charge a fee for the service, but BayBanks felt that eventually it would want to do so. Therefore, notes Lawrence, the **bank** decided to make the fee known from the outset. Besides, she adds, market research indicated that 60% of customers surveyed were willing to pay 25 cents per month for CheckView. "That was a strong indicator to us that the fee would be accepted," she says. Customers opposed to paying a fee for their monthly statement simply decline the CheckView option.

In BayBanks' case, image technology from BancTec Systems, Inc., Dallas, and Cincinnati Bell Information Systems (CBIS), Inc., Cincinnati, supplements check sorter and statement preparation systems already in place. "It didn't require a major overhaul of our system," says Lawrence.
CBIS markets software called **ImageBanc**, which combines **check images** with customer account records for production of image statements. **ImageBanc** also interfaces with other high-speed **check** processing systems, such as the Unisys **Image** Item Processing System, from Unisys Corp., Blue Bell, Pa.

BancTec markets high-speed **check** processing software called **ImageFirst**, which in September will include proof-of-deposit (POD) capabilities. Image POD brings greater efficiency to proof tasks, including balancing and **MICR** (magnetic ink character recognition) encoding, because proof operators don't handle the **checks**, but view **check images** on a workstation screen.

THE MISSING LINK. Image POD capability has been imaging's missing link since **banks** first expressed interest in the technology years ago. Of the three major providers of image processing platforms--Unisys, NCR, and IBM--only Unisys currently has an image POD product on the market.

Offerings from IBM and NCR are planned for release before yearend. NCR's image transport system, the 7780, became available April 1, following a period of beta testing at Wachovia **Bank** of Georgia's operations **center** in Atlanta.

In mid-March, Detroit's Comerica **Bank**, with $14.5 billion in assets, began using image proof-of-deposit technology and offering image statements, a product the **bank** calls CheckPhoto.

Besides CBIS's ImageBanc product, Comerica has implemented Unisys's Item Image Processing System (IIPS), which includes a high-speed reader/sorter equipped with an image camera that scans documents and item processing workstations where proof operators view and encode the **checks**. IIPS reformats the **image** files so that they can be exported to ImageBanc, which produces the image statements.

"Operators still have to enter the data, but operators using IIPS are typically twice as fast as those using traditional proof systems," says Brian Blair, director of marketing for payment systems products at Unisys. "**Banks** would need half the staff doing data entry in proof," he says, "because the operator doesn't pick up the item, code it, and then drop it into a slot on the transport."

Instead, when the checks come into the **bank** for clearing, they are scanned into a database, and the

**images** of designated **checks**
are presented to an operator at a terminal. These typically are checks that must be processed immediately in order to meet tight deadlines at other stops in the clearing cycle. The operator enters the amount of the checks as they appear on the screen, a step that facilitates balancing. Other items are encoded on power encoding equipment later in the process. Power encoding equipment is standard in most **check image** processing platforms. The way the Unisys system is designed, says Blair, once a block of items, roughly 3,000 checks, is in balance, the system instructs the operations manager to load the transit, or pre-sorted off-us items going out as cash letters to other **banks**, onto the power encoding machine. At that point, the items are sorted into their final bundles or pockets, says Blair, and the dollar amount is encoded.

POWER SAVINGS. Power encoding procedures are one area where **banks** will see processing improvements thanks to image POD systems. "Instead of encoding everything as it comes in, **banks** can selectively power encode items that have to get out the door first," says Ned Miltko, senior vice-president at Littlewood, Shain & Co. (LSC), a financial systems consulting firm based in Exton, Pa. "Items that are not sensitive can be done later."

LSC develops specialized services to users of the Unisys InfoImage platform, including CheckTrack Plus, a PC-based system that monitors check processing and workflow operations. The software produces management reports indicating, among other things, the condition of checks prior to being processed. Further gains in efficiency can be gained by spending less time preparing the work to be processed, and CheckTrack Plus helps identify sources--branches or internal departments--of unsatisfactory check work that might minimize a **bank**'s return on the technology.
Since last spring, when Comerica began using the Unisys system, the volume of **checks** processed with **image** technology has increased significantly. In April 1991, the **bank** was clearing about 5,000 items per day with the system, says Greg Goleniak, the **bank**'s vice-president, check processing. By November, the **bank** was averaging 30,000 items per day and at that time, it accepted a new software release and new power encoder equipment from Unisys. From that point on, "we've been processing 300,000 items per day, and on a peak volume day, we processed 510,000 POD unencoded items," says Goleniak. "That's an important distinction to make, because we expect to realize the savings from (power encoding) those items," he says. "We expect to realize a 20% labor savings."

The **image**-captured **checks** are stored the same way traditionally processed **checks** are stored. Accounts receiving **image** statements instead of actual **checks**, however, are rerun through the **image** platform in order to print them onto paper for mailing with the account statement.

Goleniak says the **bank** does not plan to charge a fee for providing image statements at this time. But future applications of the technology may warrant charging a fee. "The big customer service advantage to imaging comes when archiving is available," says Goleniak, referring to the ability to store item images for long periods of time and retrieve them for account inquiries. "When we can save the images for, say, 30 days, we can offer image access in the branches for better customer service, or through a home **banking** service."

Like most new technologies, expense is a major consideration in the early stages of deployment, and costs tend to decline over time. Optical disk storage is being used by numerous **banks** as a statement storage method (see "**Bank** applications fuel optical storage market," ABA BJ, Oct. 1991, p. 77), but is considered too expensive still for long-term check storage, compared to **microfilm**. **Banks** are required to keep records of account transactions for seven years under the Uniform Commercial Code.

BIG BLUE WEIGHS IN. Comerica's state rival, Michigan National **Bank**, is one of several **banks** that has been working with IBM on image capabilities based on that vendor's image processing platform, ImagePlus High Performance Transaction System. IBM announced availability of the system, which runs on an upgraded version of IBM's Check Processing Control System architecture, in February. Other **banks** working with IBM on the technology include First Tennessee National Corp., Memphis, and Providence, R.I.-based Fleet/Norstar Financial Group, which, like Michigan National, have announced **check image** statement offerings in their respective markets.
Unlike many users of image systems, Michigan National doesn't expect to save significantly on postage. "We're a little unique in that 80% of our retail customers allow us to safekeep their checks already," says Charles W. Kight, executive vice-president, operations and information technology, at the $10.6 billion-assets **bank**.

"We send those customers a listing of their checks that have cleared, so in reality, we'll pay a little more in postage to send them **check image** statements."

Kight sees other applications of the technology in the future, but only when business lines can support the associated procedural changes. "Imaging will be used pervasively," he says, "but it's a question of when to use the technology, not for its own sake, but for a business reason."

IBM's imaging efforts for financial services have been under the direction of Dr. Louise Nielsen for the past year. "Capturing images is not a new thought," she says. "The question is, what do you do with the image?

In that vein, IBM is perfecting its version of character recognition, which will enable the system to read the courtesy--or amount--box on checks, saving proof operators from doing so. Part of the ImagePlus High Performance Transaction System environment is a document identification capability which, on an individual document basis, looks for a given field, such as the courtesy box, in order to capture and process the amount. "In the future, this architecture will look at multiple fields on a document, and not just checks," says Nielsen.

IBM is testing character recognition on checks, but, like other vendors developing such capabilities, its system is not able to recognize a high enough percentage of check amounts to make the technology commercially attractive. The vendor is planning to bring **banking** customers in to run tests on their check processing work, to better judge accuracy rates for themselves.

With so many **banks** expressing interest in image technology, IBM is leaving "user exits" in its software, allowing individual **banks** to customize aspects of the software for competitive advantage. Some **banks** choose to customize the software on their own, and others turn to third-party providers, such as Check Solutions, Inc., Memphis, to customize and support the technology.

CAPITAL INVESTMENT. Image technology is a major capital investment no

matter how carefully a **bank** approaches the decision to use it.
Installing an image item processing platform can run well into the millions of dollars, so many providers are looking for ways to make the technology more affordable.
NCR announced availability of its 7780 transport system this spring. Unlike other systems, the 7780 was originally designed as an imaging system, instead of adding imaging technology to existing equipment, says Kathleen Dyer, NCR's dricetor of imaging systems in the financial systems division. The 7780, which processes up to 500 documents per minute, complements other NCR imaging systems that process up to 1,700 documents per minute. The system includes character amount recognition for scanning and storing handwritten check amounts.

"**Banks** discovered early on that it would be hard to cost justify (purchasing) mainframe-based check processing equipment," says Dyer. "We competed at Wachovia with the other vendors, and we were the only one able to offer an immediate return on investment."

The 7780 imaging applications are controlled by Intel microprocessing technology, which tends to cost less to install and maintain than larger operating environments. The software is OS/2-based and can also run on the Unix operating system, as opposed to a proprietary operating system. NCR's new transport is also less expensive than other systems because it processes items at a lower rate than the high-speed systems more commonly associated with check processing. "It's like photography," says rick Ooten, an NCR imaging product specialist. "Taking a picture of a person is one thing, but taking a picture of a bullet coming out of a gun requires a lot more technology."
The cost of implementing a version of the system that can handle 300,000 transactions per day costs roughly 41.5 million to 41.7 million, says NCR's Kathleen Dyer. Added processing power needed to run other vendors' offerings can run several times that amount, she notes.

OUTSOURCING OPTION. Another option is to outsource image processing to one of a growing number of third parties that provide the service. Nationar, a Woodbury, N.Y. outsourcer, had signed up three clients, all savings **banks**, as of the end of March.

"A lot of **banks** like to consider themselves leading edge technologically," says Stephanie Berger, business manager of Nationar's image statement product, "but not all of them can afford it. That's where the outsourcing alternative comes in."

Berger says that **banks** considering implementing **check image** processing or offering **check image** statements can use providers like Nationar to pilot test the technology to see if it catches on in their markets. They can then either continue to outsource or bring the function in-house.

Now that IBM's High Performance Transaction System is operational, EDS, the outsourcing firm based in Dallas, has begun to market those image processing capabilities to clients on the West Coast. EDS' San Diego facility is equipped to clear clients' checks using imaging, and other facilities will gain that capability as market conditions require it, says

Joe Cothran, division vice-president for back-office operations.

"We currently mail about 2 million DDA statements per month from our California mail house," notes Cothran, "so we have a fairly substantial client base today. One reason we decided to put the (imaging) lab in California is that there were a large number of IBM early install program participants that were financial institutions in the California marketplace, so we think the competitive pressures are likely to show up there fairly quickly now."

Imaging vendors will announce still more systems in the months ahead, as the market for image Systems matures.

**Banks** currently working with vendors on systems, and those considering doing so, would do well to influence the vendors where possible toward developing standard systems, say industry observers. By doing so, all **banks** will benefit down the road from this important technology, and electronic interbank check clearing, or the "checkless society," may one day be more than pie in the sky.

**THIS IS THE FULL-TEXT.**



**Company Names:**
Federal Reserve Board
Cincinnati Bell Information Systems Inc ( Duns: 10-355-6585 )
Comerica **Bank** ( Duns: 00-695-7856 )
Michigan National Bank ( Duns: 06-983-6146 )
IBM Corp ( Duns: 00-136-8083 Ticker: IBM )
**Geographic Names:** US

**Descriptors:** Checks ; **Banks**; Image processing system ; Trends; Manycompanies; Government agencies; Customer services; Advantages
**Classification Codes:** 9190 (CN=United States); 8100 (CN=Financial services industry); 9550 (CN=Public sector); 5240 (CN=Software & systems)

11/9/4 (Item 4 from file: 15) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
ABI/Inform(R)

00252027 84-30588
**Central Bank's Computerized Micrographics System Verifies Customers' Signatures**

Anonymous
IMC Journal v20n3 pp: 45-47
Third Quarter 1984
**CODEN:** IMGCB7
**ISSN:** 0160-127X **Journal Code:** IMC
**Document Type:** Journal article **Language:** English **Length:** 3 Pages

**Abstract:**

The **Central Bank** of California needed a new signature verification system when it decided to centralize its demand **deposit** account (DDA) system and stop sending **checks** back to the branches. **Central Bank** uses 2 Kodak IMT-150 microimage terminals with computer-assisted retrieval (CAR) coupled with 2 computer terminals. During the verification process, the microimage terminal displays signature card images. The operator compares the card **image** to the signature on the **check** presented for verification. The **bank** chose the Kodak system partly because other **bank** operations could be performed on the terminals when signatures are not being verified. The **bank**'s project manager, Mike Harvey, wrote 2 programs to drive the signature verification system. The criteria for determining which checks to verify can be changed easily with this program. The **bank** filmed cards from 3-4 branches each week until all 60 branches were converted.

**Descriptors: Banking** industry; Case studies; CAR; **Micrographics**; Systems; Checks ; Verification; Demand deposit accounts
**Classification Codes:** 9110 (CN=Company specific); 8120 (CN=Retail banking); 5260 (CN=Records management)

11/9/5 (Item 1 from file: 9) <u>Links</u>

01219984 Supplier Number: 23815141 **(THIS IS THE FULLTEXT)**
**POD Check Imaging Faces New Challenges**
**( In 1995 vs 1996, banks raised investment in check imaging by 9% from $198 mil and $215 mil; new lost cost POD technology keeps costs down )**

Bank Technology News , v 10 , n 3 , p 23
March 1997
**Document Type:** Journal **ISSN:** 1060-3506 ( United States )
**Language:** English **Record Type:** Fulltext
**Word Count:** 1006

**ABSTRACT:**
In 1995 vs 1996, **banks** raised investment in check imaging by 9% from $198 mil and $215 mil, according to Mentis Corp (Durham, NC). Much of the investment occureed in the back-end of the check processing cycle, such as statement rendering or storage and retrieval applications. Large **banks** are sticking with paper-based **check** processing, and are slow to move to **imaged**-based proof-of-deposit (POD), unlike small **banks**, which have been investing in imaged-based POD. The **Bank** Administration Institute reports that less than 10% of respondents to its annual survey had installed imaging for POD by late 1995. Some 71% of these respondents were **banks** with more than $5 bil in assets. Only 6% pf the respondents had assets of less than $1 bil. The full text includes discussion of truncation, electronic encoding and other issues.

**TEXT:**

**Banks** like Michigan National are using low-cost technology that virtually eliminates the business case for image-based proof of deposit.

BY PATRICIA A. MURPHY

It's getting harder and harder to cost-justify the multi-million dollar investment required to add **image** technology to large proof-of-**deposit** (POD) **check** processing operations. That's not to say that **banks** are not investing in **image**-based **check** processing. Between 1995 and 1996, **banks** increased their investment in check imaging by nine percent, from $198 million to $215 million, according to Mentis Corp., Durham, NC.

But much of the investment occurred in the back-end of the check processing

Small **banks**, too, have spent heavily on check imaging, even in the more complicated front-end POD arena; since their small size makes such implementations more cost effective, not to mention easier to handle. But large **banks**, which have honed paper-based check processing to practically an art form, are balking at moving to image-based POD. The **Bank** Administration Institute reports that less than 10 percent of respondents to its annual survey had installed imaging for POD by late 1995. The preponderance of these respondents -- 71 percent -- were **banks** with more than $5 billion in assets. Only six percent of the respondents had assets of less than $1 billion.

Nearly two-thirds of the respondents to BAI's survey were still discussing the merits of POD imaging, a technology that's at least a decade old. The main reason for not implementing it? Almost 90 percent of the **bankers** queried cited cost.

"Image POD up to this point has not been a winner simply because the business case has not been there," explains Ron Thompson, vice president, business development, ImageSoft Technologies, the Maitland, FL-based unit of Fiserv that specializes in check imaging solutions. It's a quandary of sorts: Because **banks** have become so good at processing the paper associated with check payments, the business case for imaging is that much tougher to justify.

No business case

And it's getting tougher. Now, some **banks** have found ways to hone the paper process further. In effect, they are achieving significantly greater efficiencies in check processing for substantially smaller investments than imaging requires. In fact, these new processes are virtually eliminating the business case for POD imaging.

Michigan National **Bank** is a case in point. The **bank** is an undeniable fan of imaging. It has in place several image applications, including image statements, remote **image** capture and a COD-ROM **check image** delivery product. But the **bank** can't build a business case for image POD that meets the **bank**'s payback requirements, says Mickey Brown, head of information technology and **bank** operations at the **bank**'s Lansing, MI, operations **center**.

Truncation does the trick

The reason is an item-truncation system installed by the **bank** in its branches in 1992, which has eliminated about three-quarters of the paper associated with over-the-counter **check deposits**, not to mention 22 proof encoders. The system, which Michigan National has since sold to Antinori Software Inc., Atlanta paid for itself in its first year, says Brown, and continues to generate $800,000 a year in savings for the **bank**. "It's helped us drive down expenses, which has made image that much harder to justify," explains Brown.
In analyzing its check paper flow, Brown says Michigan National determined that 85 percent of the **bank**'s over-the-counter deposit transactions

consisted of five items or less, and that those items could be swiped through a **MICR** reader without any slowing of teller productivity. In fact, overall productivity can be improved, since deposits must balance at the teller window before they go any further through the system, notes Brown.

In the item-truncation environment that Michigan National has instituted in its branches, customers give tellers the items to be deposited, their account numbers and any required identification. The teller swipes each check through a **MICR** reader and keys in the amount of the item. The account is balanced immediately through the teller system, while the **MICR** number and deposit amount are transmitted electronically via an internal network to the **bank**'s check operations **center**.
Later, when the paper checks arrive at the proof department, each is power-encoded with the dollar amount that was transmitted earlier in the day from the teller station.

Electronic encoding

Encoding is a fundamental component of check processing, and by most accounts, the largest component of check processing labor. Encoding refers to the process of inscribing the dollar amount and other pertinent data, using magnetic ink, on **checks** and related documents. Typically, **deposits** also are balanced during the encoding process, but in the case of Michigan National, this is no longer necessary since most deposits are balanced by the teller.

For Michigan National, the real savings accrue from the fact that the **bank**'s branch item-truncation system allows it to power encode (read: electronically encode) the vast majority of checks that move through its shop instead of encoding the information by hand. Brown says every teller station in each of Michigan National's 198 branches has been equipped with **MICR** readers. These **MICR** readers, provided by Checkmate Electronics, Inc., Roswell, GA, are integrated with branch item-truncation software, available from Antinori Software.

Others to follow

Les Cowie, Checkmate vice president, says he expects other **banks** will follow Michigan National's lead. Cowie estimates that a mid-sized **bank** with 1,000 teller stations can equip its branches with **MICR** readers and associated card terminals at a cost of between $250,000 and $500,000. Cowie also estimates a pay-back of less than six months, based on back-office efficiencies as well as better front-line detection of fraudulent checks.
But more to the point, adds Mike Israel, senior vice president of Antinori Software, branch-item truncation for many **banks** will all but eliminate the business for image POD. "It certainly is a viable alternative to image POD," he says.

And so the story goes: As long as **banks** continue to enhance their efficiency in processing checks, the promise of large-scale imaging will likely continue to be an elusive.

Barriers To Imaging
Cost topped the list of reasons for not implementing imaging.
(Respondents could cite more than one reason.)

| | |
|---|---|
| Cost prohibitive | 89% |
| Internal proiritization | 51% |
| Vendor's inability | 32% |
| Lack of standards | 14% |
| Other | 14% |

Source: **Bank** Administration Institute



**Special Features:** Table
**Industry Names: Banking**; Financial services; Industrial machinery
**Product Names:** Special industry machinery and equipment NEC (355995); National and state commercial **banks** (602000)
**Concept Terms:** All company; All market information; Capital expenditures; Market size
**Geographic Names:** North America (NOAX); United States (USA)